Acta Mineralogica-Petrographica, Abstract Series 2, Szeged, 2003

FLUID INCLUSION STUDY ON STRINGER SYSTEM, YONGPING MASSIVE SULPHIDE COPPER DEPOSIT, JIANGXI PROVINCE, CHINA

NI, P.[1], GU, L. X.[2], LING, H. F.[1], ZAW, K.[3]
[1] Stake Key Laboratory of Mineral deposit Research, Nanjing University, Nanjing 210093,China.
[2] Department of Earth Science, Nanjing University, Nanjing 210093,China.
[3] Centre for Ore Deposit Research, University of Tasmania, GPO Box 252-79, Hobart, Tasmania, 7001,Australia.
E-mail: peini@nju.edu.cn

Yongping super-large massive sulphide copper deposit is located in Xinjiang sedimentary basin near Qianshan County, Jiangxi Province, China and is currently being mined as open pits. The tectonic setting of this deposit belongs to the Qiantangjiang-Xinjiang Hercynian –Indosinian fault-bounded depress zone of South China platform, the basement of which consists of phyllites, schistes and gneisses of pre-Devonian age. Yongping copper deposit occurred in early-middle caborniferous Yejiawan formation, which consists mainly of limestone, marly limestone with less sandstone and shales as intercalated bed. Within the host strata, some exhalative sedimentary rocks such as silicalite, jasper rock et al. can also been identified.

Stratiform and sub-stratiform ore bodies are the majority of the deposit, in which the primary ore minerals dominated by pyrite and chalcopyrite, with a minor amount of pyrrhotite, galena, and sphalerite. Underling the stratiform ore bodies, there are at least three stages of stringer veins, which consist of different type of ore minerals and gangues. The first stage of stringer veins mainly consists of pyrite and quartz. The second stage of stringer veins is made of pyrite, chalcopyrite and quartz. The third stage of stringer veins was mainly composed of calcite, few quartz and pyrite with a little amount of galena, and sphalerite.

Double polished wafers of stages of stringer veins were prepared for detailed fluid inclusion petrography study and temperature determination. Quartz representing the three stages of stringer veins was also seperated, leached by HCl to remove intergrown carbonate minerals. Then inclusion fluids obtained from the quartz by decrepitation method were used for determination of and then determined for oxygen isotope composition. Inclusion fluids obtained from the quartz by decrepitation were used for determination of hydrogen and REE content.

Fluid inclusion petrography and microthermometry

Based on the fluid inclusion phase behavior under the room temperature, three fluid inclusion type can be identified as follows: Type I: vapour-rich two phase aqueous inclusions (L+V); Type II: daughter-bearing three phase aqueous inclusion (L+V+S); Type III: liquid-rich two phase aqueous inclusions (L+V). The temperature determinations were done in the Linkam THMSG600 stage.

First stage stringer vein contain fluid inclusion type III only, the fluid inclusions size varies from 5 to 15 μm, and gas phase occupied 10 to 30 percent of total volume. The homogenization temperature change from 172°C to 328°C,and salinities varies from 6.4 to 9.3 wt% NaCl equiv.

Second stage stringer vein was composed of three type of fluid inclusion:type I, Type II and Type III. The type I and type II inclusions have a similar homogenization temperature, which are 368~395°C and 360~395°C respectively. Salinities of them were 1.2~3.3 wt%NaCl equiv. and 41.2~45.5 wt%NaCl equiv. respectively. The type III inclusions have salinities between type I and type II, and a little higher homogenization temperatures.

Third stage stringer vein again just contain type III fluid inclusion. The fluid inclusions size varies from 6 to 20um, and gas phase occupied 10 to 40 percent of total volume. The homogenization temperature change from 168°C to 347°C,and salinities varies from 3.5 to 7.9 wt% NaCl equiv.

REE characteristics of inclusion fluids

Inclusion fluids from samples of three stages of stringer veins have been determination for REE contents by ICP-MS in the State Key Laboratory of Mineral Deposit Research, Nanjing University. The REE patterns of these inclusion fluids were normalized to chondrite

Oxygen and hydrogen isotope characteristics of the fluids

Inclusion fluids from samples of three stages of stringer veins have been used for Isotope measurement, which were performed using a mass spectrometer Mat 252 in State Key Laboratory of Mineral Deposit Research, Nanjing University.

Conclusions

1. Fluid inclusions from stringer vein in Yongping massive sulphide deposit were similar to that of typical MSD stringer veins in houkuroku, Japan (Visut et al., 1983) and Hellyer VHMSD, Australia (Zaw et al., 1996) .It is also similar to fluid inclusions in modern sea floor polymetallic massive sulphide deposits.
2. Temperature, salinities and REE characteristics of inclusion fluids from stringer vein (with negative anomaly of Ce and positive anomaly of Eu), are similar to that of high temperature fluid discharged from hydrothermal field of modern seafloor.
3. Ore-forming fluids have undergone waxing and wanning stages. At the first mineralization stage, fluid temperature was lower and the amount of ore-forming metal elements contents in fluid is little. Later, accompanying the forming of the second stage of stringer veins, the contents of metal elements in fluid increased and the temperature rised contemporarily. Fluid exhaled to the sea floor, forming the main stratiform orebodies. In this stage boiling phenomenon was observed. Finally with the decreasing of metal elements contents and temperature of the fluid, the third stage of stringer veins was formed.
4. One typical feature of the fluid inclusion in Yongping massive sulphide deposit is that it has experienced boiling process. Such feature has not been seen in other typical MSD deposits. Such boiling process was in accordant with the shallow sea environment during the Yongping copper deposit formation.
5. Ore-forming fluids of Yongping massive sulphide copper deposit were originated from seawater and were mixed with part of magmatic fluids.

Acknowledgement

Chinese NSFC project (40234051, 40221301, 49733121) and state key basic research project (G1999043211-5) joint support the present study.

References

VISUT P,A. & HIROSHI, O. (1983): Thermal history, and chemical and isotopic composiyions of the ore-forning fluids responsible fir the Kuroko massive sulfide deposits in the Hokuroku distric of Japan, Economic Geology, Monograph **5**, 523-558

ZAW, K., GEMMELL, J. B. LARGE, R. R. MERNAGH, T. P. & RYAN, C. G (1996): Evolution and source of ore fluids in the stringer system, Hellyer VHMS deposit, Tasmania, Australia: evidence from fluid inclusion microthermometry and geochemistry, Ore Geology Reviews, **10**, 251-278